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(57) Abstract

A novel dextrin-type starch is suitable for supplying energy to human beings in preparation for or after a physical activity. The starch is characterized in that it has a molecular weight of from about 15,000 to about 10,000,000, and in that its molecules are heavily branched. The invention also relates to a composition and to a method for supplying energy preparatory to a physical activity, there being used a starch according to the invention.

Energy formulation

The present invention relates to a novel sort of starch which is suitable for compositions which are intended to supply energy to human beings and other mammals. The invention relates in particular to a kind of starch and a composition produced therefrom for supplying energy to human beings in preparation for or after physical activity. The invention also relates to a method of producing the starch and also to a method of supplying energy to human beings as a preparatory measure before a physical activity, for instance a sporting activity, and after performing strenuous work, so as to minimize the risk of overtraining.

When performing hard muscular work, the body takes energy from glycogen stored in the muscles and liver. If these stored depots are emptied, energy is taken from the breaking down of proteins. This can result in symptoms of overtraining and in a lowering of the immunological defense against infections.

After the glycogen depots have been emptied completely, glycogen levels which exceed the initial levels quantitatively can be recreated by taking up carbohydrates. In traditional body charging processes, it is normal to eat food which is poor in carbohydrates prior to emptying the depots, whereafter the person concerned charges his/her body with food rich in carbohydrates. It is estimated that about 200 g of active carbohydrates are required for this charging process, corresponding to about 1 kg of cooked pasta. It is difficult to ingest this amount on a daily basis. By reducing the water retention capacity, it is possible to increase the active substance content and in this way ingest the food in the form of a drink instead of in a solid state, therewith facilitating ingestion.

When ingesting excess carbohydrates, glycogen is synthesized until the depots are filled. The synthesis of glycogen can take two different routes. The first route passes from glucose 6-P via glucose 1-P to UDP-D glucose, which forms glycogen. Energy (2 ATP) is consumed in the course of this synthesis. In the second route of glycogen synthesis, the glycogen is formed by reaction between UDP glucose and an initiation molecule, which

A large number of compositions which are intended to provide energy in some suitable form in conjunction with physical activities are known from the literature. See for instance WO 91/12734, WO 91/09358 and EP-A2-0,264,117, US-A-4,312,856 and US-A-4,649,-051, which contain references to a considerable number of further works. The prior art compositions, however, contain mostly carbohydrates of low to average molecular weights, such as monosaccharides, disaccharides and oligosaccharides, for instance, glucose, fructose and saccharose, and maltodextrin as an example of a carbohydrate of average molecular weight. These compositions are intended to be ingested immediately prior to and during the physical activity and provide an almost instantaneous energy boost. They are not suitable for building up glycogen depots in preparation for the physical activity, and neither are they intended for this purpose. This feature constitutes a considerable difference in relation to the type of starch according to the present invention. A starch of this kind is a novel product which is not previously described in the literature or forms part of the prior art in any other way.

The inventive starch has the general formula $(C_6H_{10}O_5)_n$, where n is the number of repeating glucose units and thus the degree of polymerization. This value also determines the molecular weight, so that the molecular weight range of from about 15,000 to about 10,000,000 will correspond to a value of n from about 90 to about 65,000. The molecular weight and its distribution can be determined by gel chromatography in a known way, wherein the retention times are compared with those of calibration standards of starch types having known molecular weights. When the resultant chromatogram is presented graphically, the areas beneath the resultant peaks provide a quantitative measurement of the proportions of fractions of different molecular weights.

The inventive starch shall also be heavily branched. The degree of molecular branching can be expressed as a percentage. The percentage expresses the amount ratio between α-1,6 bonds and α-1,4 bonds and in native potato starch is about 3.1%. This can be determined by means of nuclear magnetic resonance measurements (NMR) on deuterated starch samples. When an inventive starch is analyzed in this way, it will be found that there have occurred novel types of bonds which do not occur traditionally in native starch.

composition may still further also include salts and electrolytes, although these do not constitute necessary components, as the composition is primarily intended for ingestion some considerable time before the physical activity is performed. Salts and electrolytes are mainly intended to replace body losses of these substances that occur through transpiration while performing the physical activity, and shall thus primarily be ingested immediately prior to or during the activity.

The composition can be provided as a ready-to-drink aqueous solution or in the form of a liquid concentrate or in the form of a dry mixture to which water shall be added in an amount which will provide a concentration suitable for ingestion. A ready-to-consume aqueous solution of the composition will suitably contain an inventive starch in an amount corresponding to 100 to 250 g/l, this amount depending on the desired consistency of the finished composition.

The inventive starch is mainly intended for ingestion as an energy supplier in preparation for physical activity, for instance sporting activities, one or a few days before the activity is actually performed. The starch is then ingested in the form of a suitable composition in accordance with the above and is intended as a supplement to a conventional carbohydrate charging process. This enables large quantities of glycogen to be stored-up in the depots without the need to eat large quantities of food rich in carbohydrates, for instance boiled pasta or rice.

An inventive composition can be prepared by stirring the starch in cold water and allowing the starch to stand and swell for about fifteen minutes. In order to obtain a drinkable consistency, about 180 grams of starch should be used for each litre of cold water. An addition of about 210 grams of starch per litre will give a soup-like consistency, while an addition of about 240 grams per litre will give a cream-like consistency. Further preparation components, such as the aforesaid components, can either be added to the produced composition or can be mixed with the starch prior to stirring the starch in water. This enables the composition to be provided in portioned quantities, which need only be stirred into a suitable quantity of water to provide a consumption-ready portion.

sportsmen whose diets were supplemented with an inventive starch. It was found that the group supplemented with the inventive carbohydrate produced significantly better results.

9. The use of a starch according to any one of Claims 1-3 or a composition according to Claim 6 or Claim 7 for supplying energy to a human being preparatory to or after a physical activity.

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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